

ABSTRACT

A method and apparatus for controlling the quenching rate of a monocrystalline ingot pulled from a melt by adjusting one or more post growth processing parameter. A temperature model generates a temperature profile that represents the surface temperature along the length of the ingot at the instant it is pulled from the melt. A first temperature at a particular location along the length of the crystal is determined from the temperature profile. A temperature sensor senses a second temperature at the same particular location. A PLC calculates a quenching rate of the crystal as a function of the first temperature and the second temperature. The PLC generates an error between a target quenching rate and a calculated quenching rate, and one or more post growth process parameters are adjusted as function of the error signal to optimize the quenching rate. Alternatively, temperature readings from the sensor are collected and the quenching rates of the crystal are calculated after crystal growth and post growth quenching. One or more post growth process parameters are modified and programmed for subsequent crystal growth and post growth quenching to achieve optimized quenching rate and crystal quality.